

T-3012

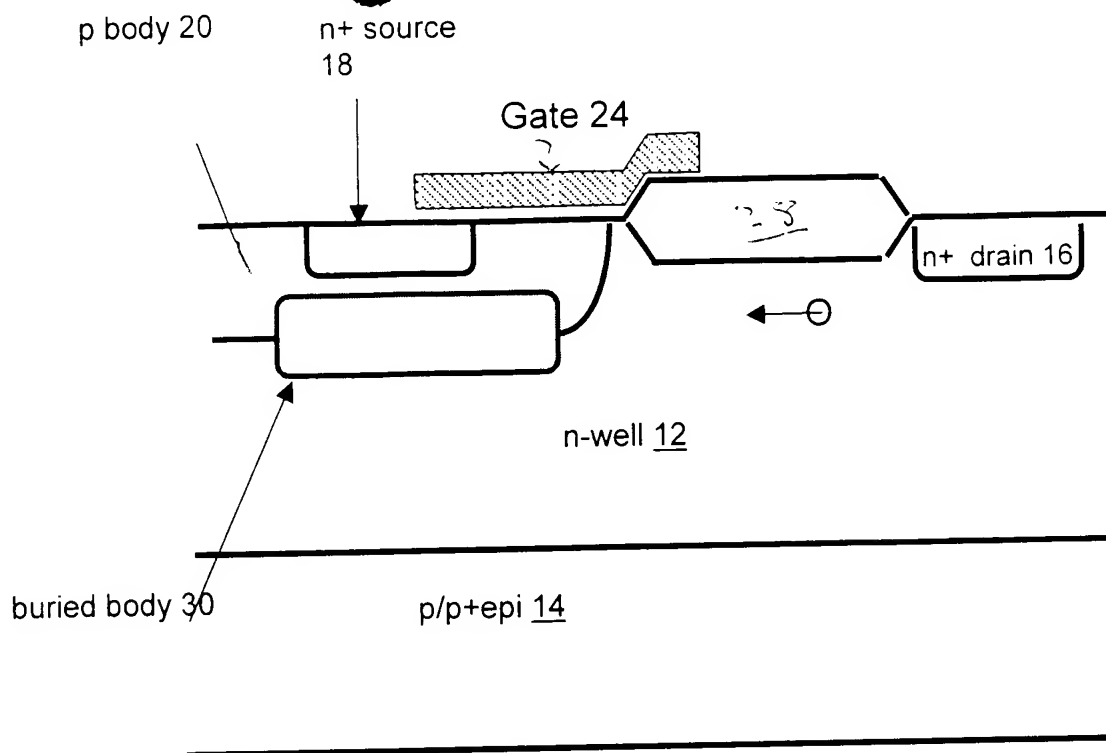


Figure 1

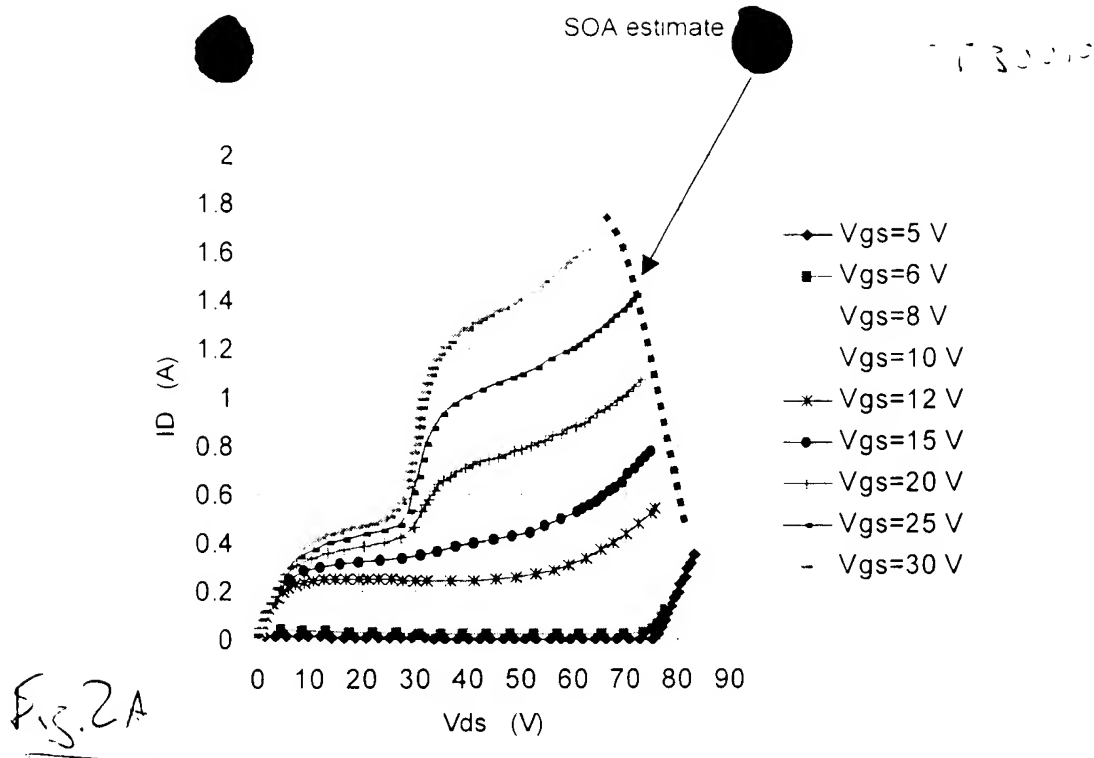


Fig. 2R. Drain characteristic for buried body LDMOS. Pulse measurements with pulse time of 100ns. The approximate location of the SOA boundary is indicated by the dashed line. The increase in ID seen near  $V_{ds}=30V$  is an indication that charge compensation due to holes is occurring in the Nwell.  $W=0.0938$  cm.

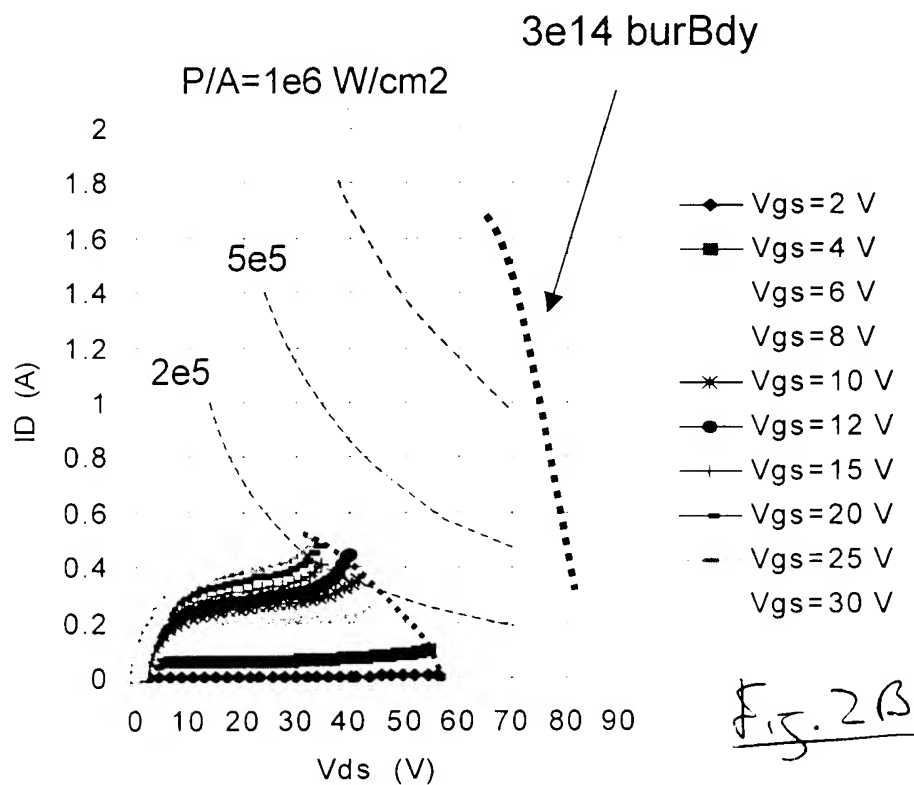
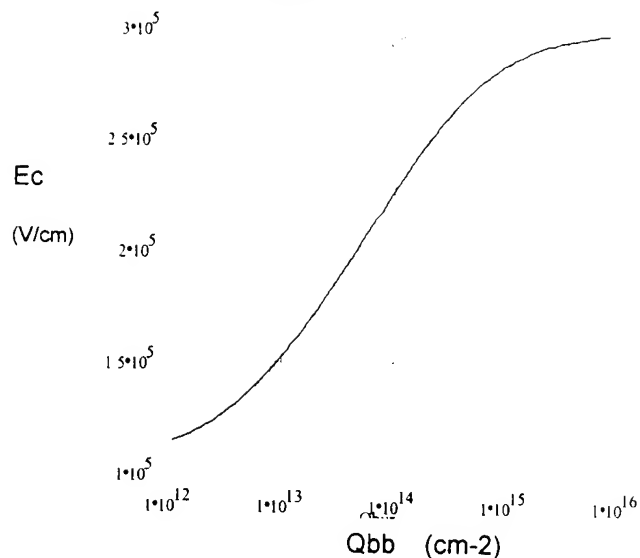
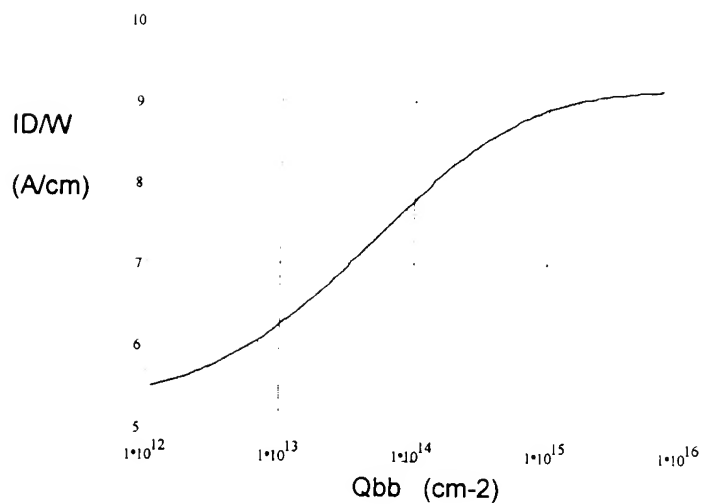


Fig. 3. Drain characteristic for the same LDMOS as in Fig. 2R but without the buried body. The SOA for the buried body LDMOS is indicated and exceeds  $1e6$  W/cm<sup>2</sup> and shows more than a factor of 5 improvement over the conventional LDMOS.



} (a)



} (b)

Fig. 3. (a) critical field vs. buried body dose for an n-Ldmos constructed as in Fig. 1. Calculating using the one-dimensional model of [1] and Eqs. (2), (3), and (4). (b) Corresponding drain current per unit gate width vs. buried body dose.

Done prior to this step

Material Start, 20um p-epi on p+ sub <100>  
 First oxidation 7500A  
 Hard mask deposit  
 n+ buried layer photo and etch  
 Antimony implant 3 to 6e15 cm-2  
 Buried layer diffusion\*  
 Strip surface oxide  
 p-epi deposit 9 to 10 um 7ohm-cm  
 2nd oxidation 7500A

\*not shown here, for a "low-side" Ldmos. A "high-side" Ldmos will have an n+ buried layer placed beneath the window.

This step

Nwell photo  
 oxide etch  
 Nwell implant phosphorous 3 to 5 e12 cm-2

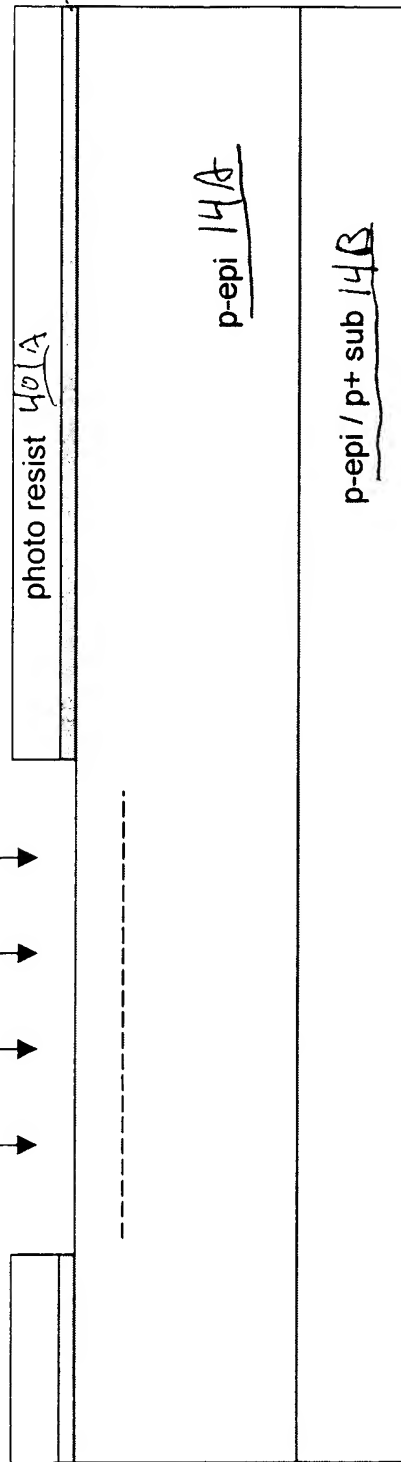
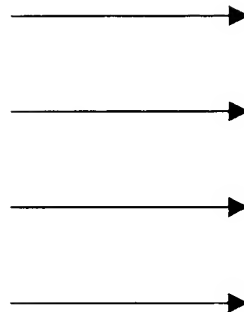


Fig. 4A

Done prior to this step

Nwell diffusion xj = 4 to 6  $\mu\text{m}$   
 n+sinker photo and etch  
 n+ deposit POCl<sub>3</sub>  
 strip oxide  
 pad oxidation 350A  
 CMOS Nwell photo and implant (not shown)  
 CMOS Pwell photo and implant (not shown)  
 diffusion

This step

Dwell (p-body) photo  
 Dwell Boron implant 3 to 7e13 @ 50 keV  
 Dwell Arsenic implant 3 to 8e13 @ 135 keV  
 Dwell Boron MeV implant 1 to 4e14 @ 300 to 600 keV  
 (Buried Body)

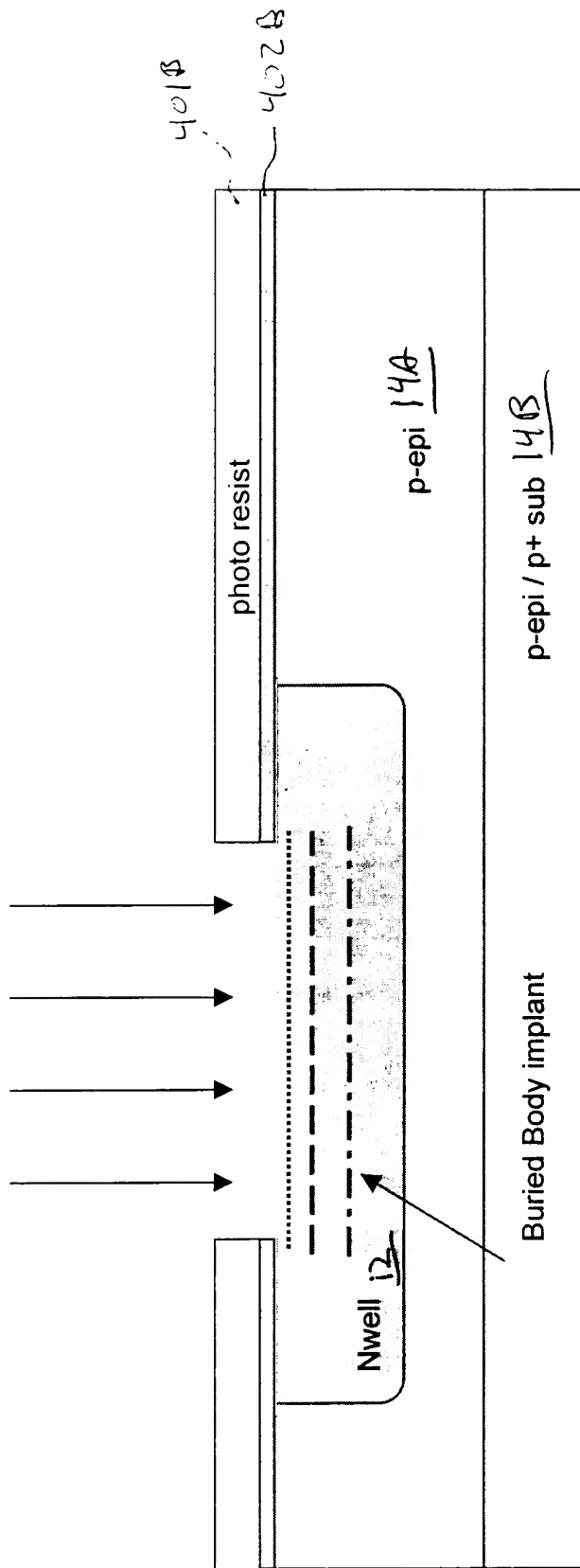


Fig. 4B

Done prior to this step

Dwell diffusion xj= 2 to 2.5  $\mu$ m  
 strip oxide  
 pad oxidation 200 to 400A  
 Base photo (not shown)  
 Base implant (not shown)  
 nitride deposition 1000 to 1500A  
 Locos photo and nitride etch  
 resist strip

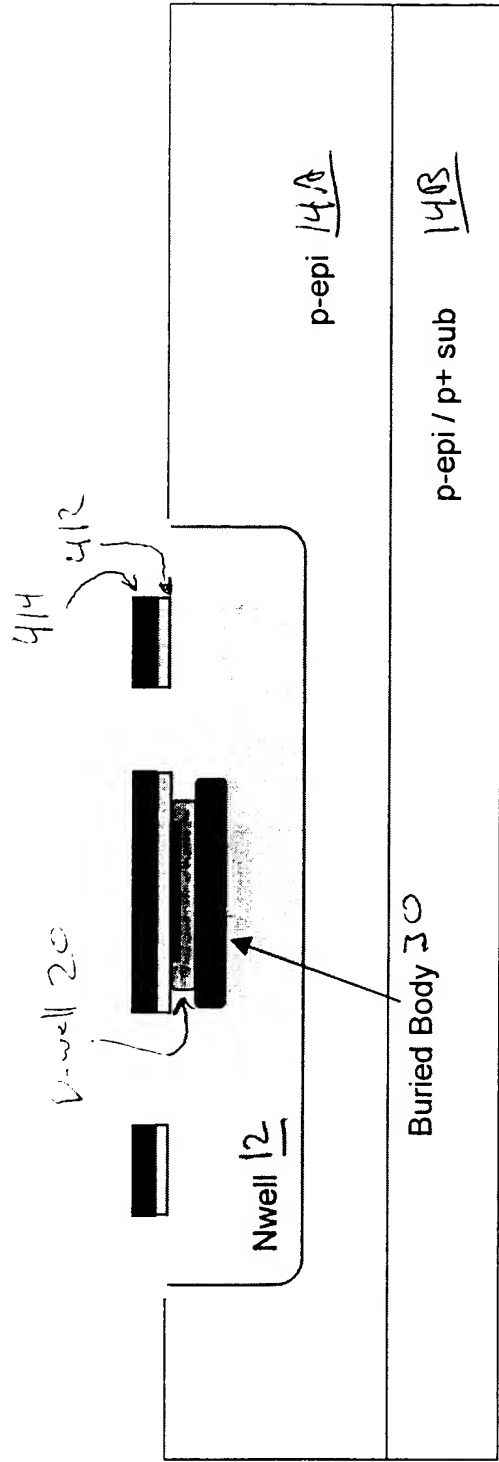
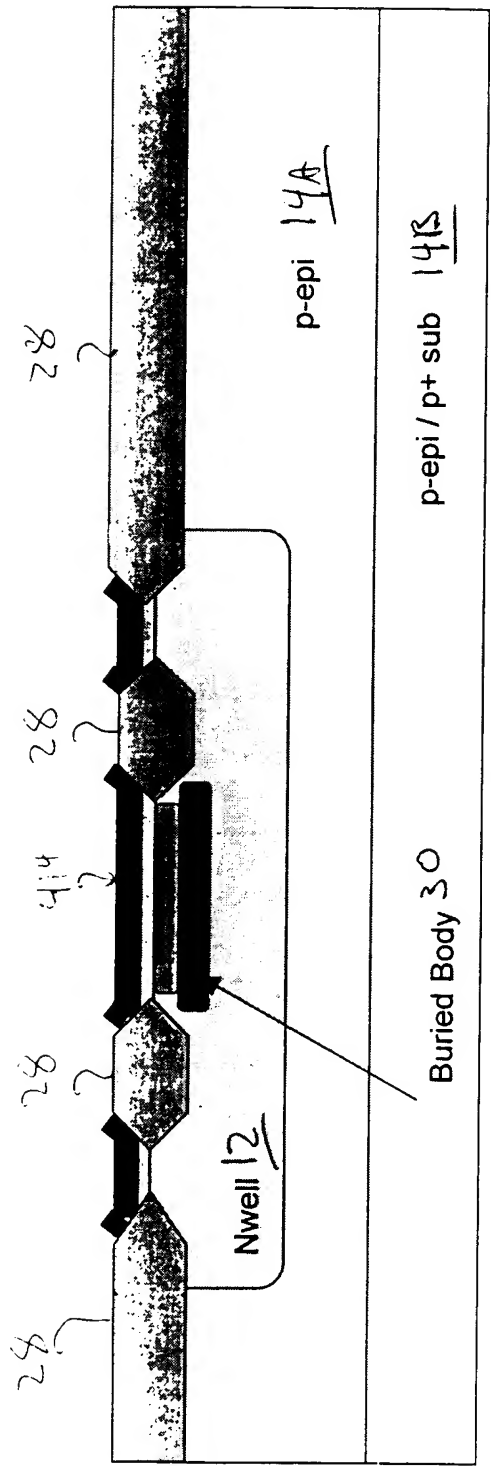


fig. 41C

Done this step  
Field oxidation 6000 to 7000 Å



f.3. 4D

Done prior to this step

strip nitride  
sacrificial oxidation 300A  
etch oxide 800 A  
gate oxidation 300 to 400 A  
threshold adjust photo and implants (not shown)

Done this step

SNwell photo

SNwell MeV implant Phos 3 to 6 e13 @ 800 to 900 keV

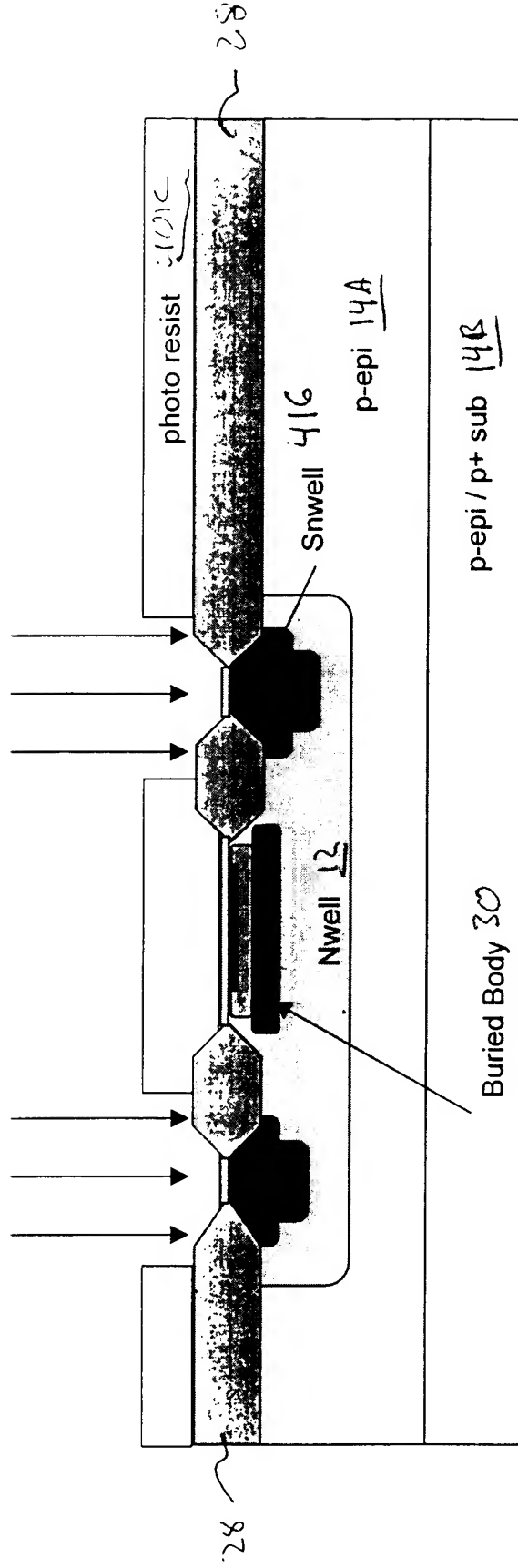


Fig. 4E



Done prior to this step

Strip photo

SNwell Rapid Thermal Anneal

Deposit n+ poly 5kA

poly photo and etch

cap oxide deposit 350A TEOS

CMOS nLDD and pLDD photo and implants (not shown)

nitride sidewall deposit 1200 to 1600 A

nitride sidewall etch

This step

n+ source/drain photo

n+ source/drain implant Phosphorous 2 to 6e14 cm-2

n+ source/drain implant Arsenic 2 to 4e15 cm-2

strip resist

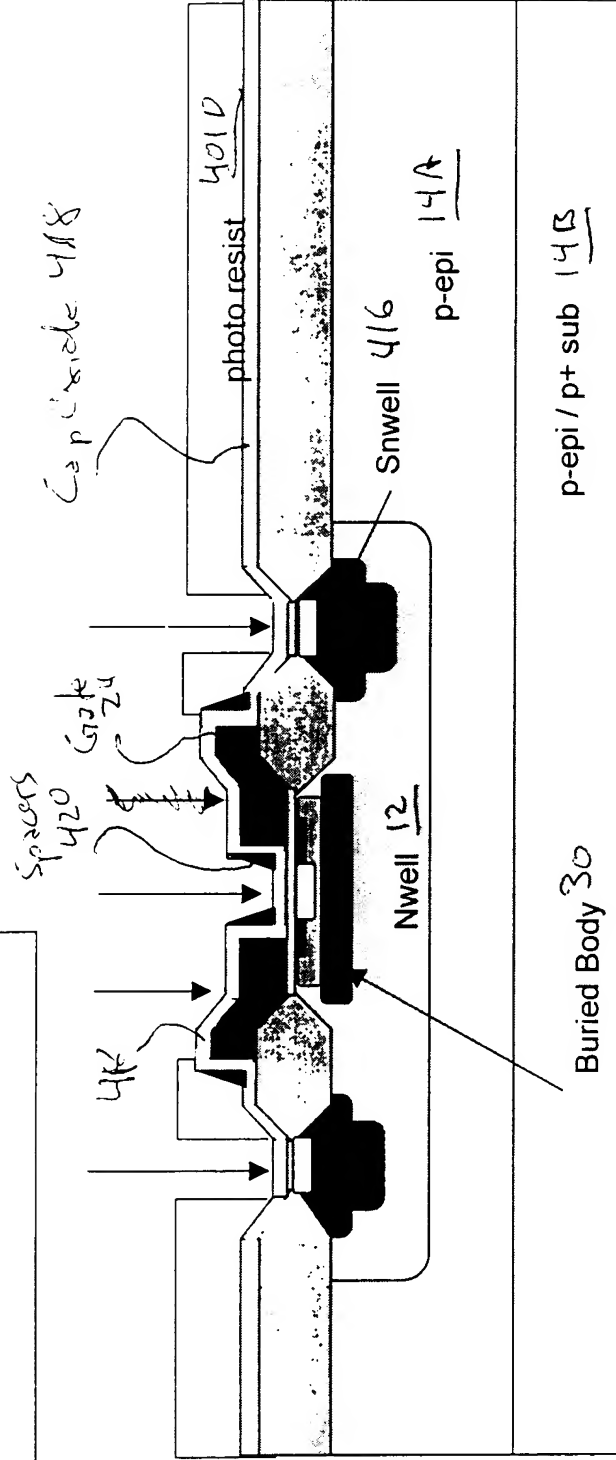


FIG. 4F

Done this step

p+ source/drain photo  
p+ source/drain implant Boron 1.5 to 3e15  
strip resist

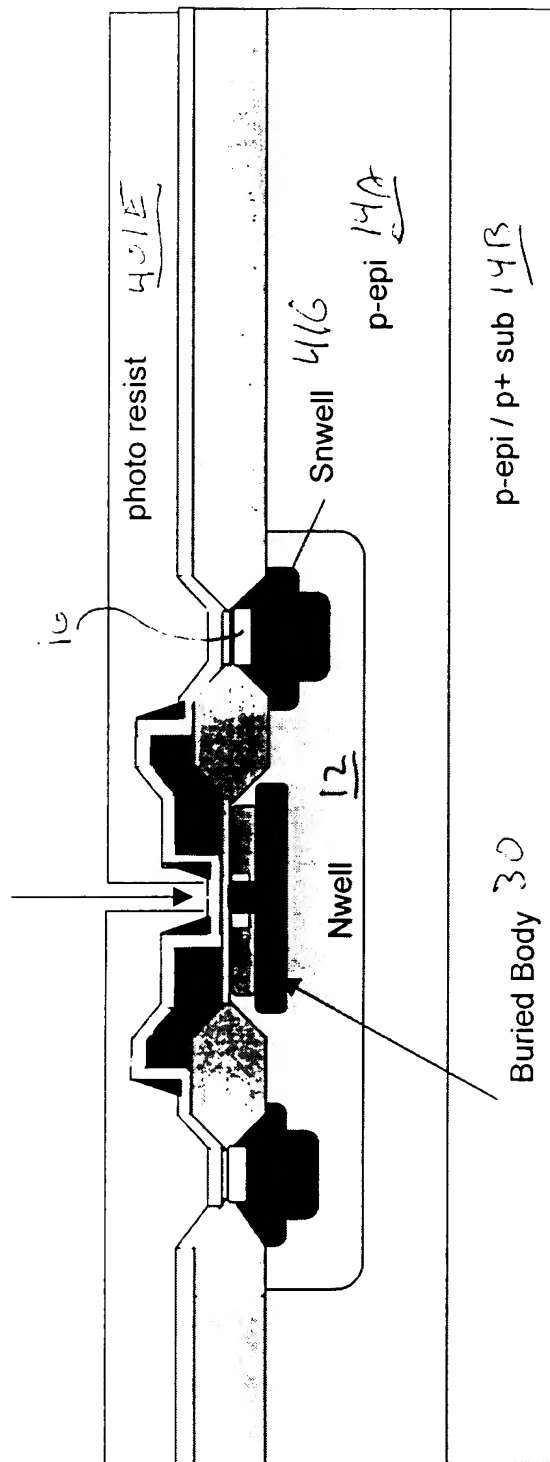


Fig. 4/6

Done prior to this step

Deposit NSG (non-doped silicon glass) plus  
BPSG (boron and phosphorous doped silicon glass)  
6kA to 9kA (not shown)  
BPSG densification (will flow glass, rounding sharp edges)  
Contact photo and etch  
Platinum deposit 300 to 600 Å  
Platinum sinter  
Aqua regia etch (removes Pt on oxide and leaves Platinum silicide  
in contact areas)

Done this step

Deposit Metal Al/Si/TiW 5k to 8k Å  
Metal photo  
Metal etch (metal pattern will conform to  
curved BPSG layer, needed for step  
coverage)

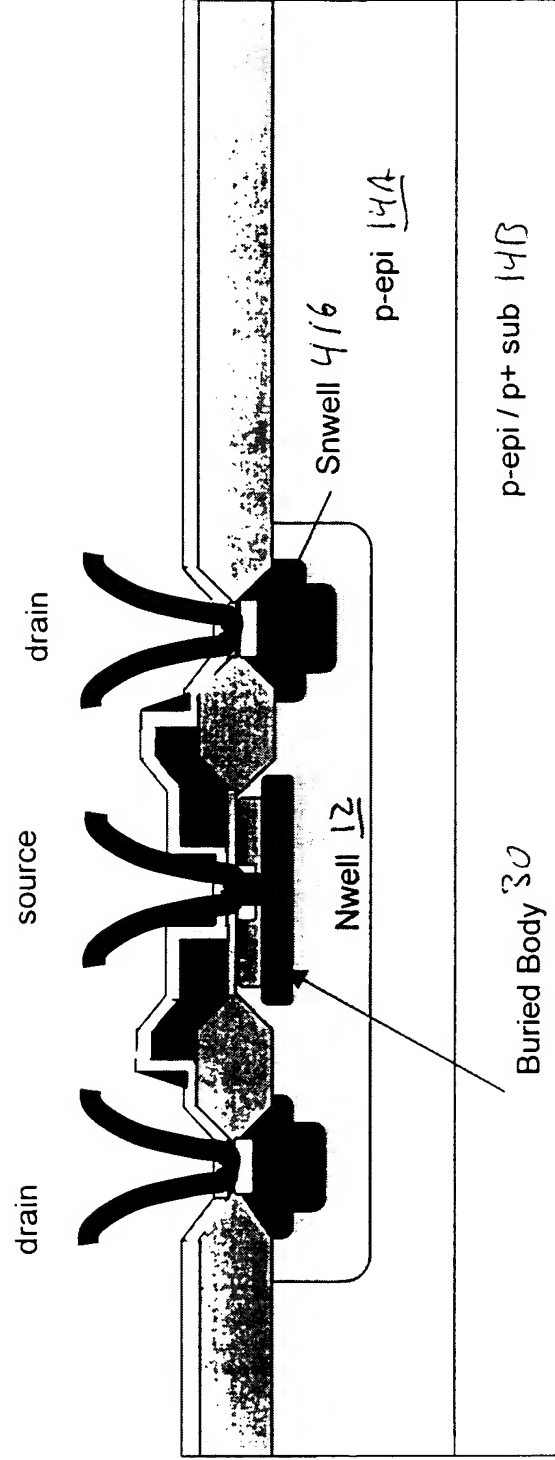


Fig. 4.11

# Lbc5 60V Low-side Ldmos nch\_ldmls\_hv3

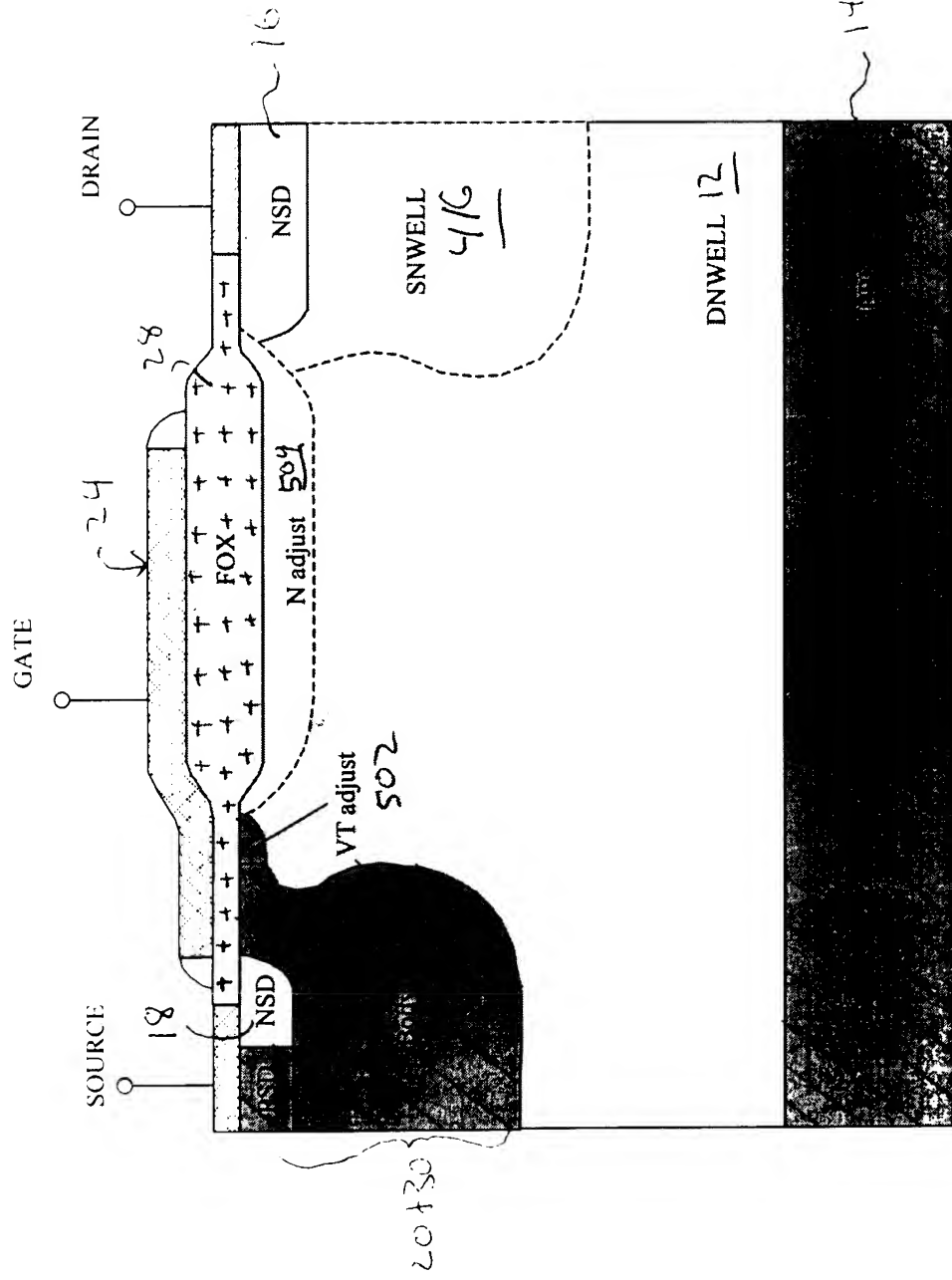
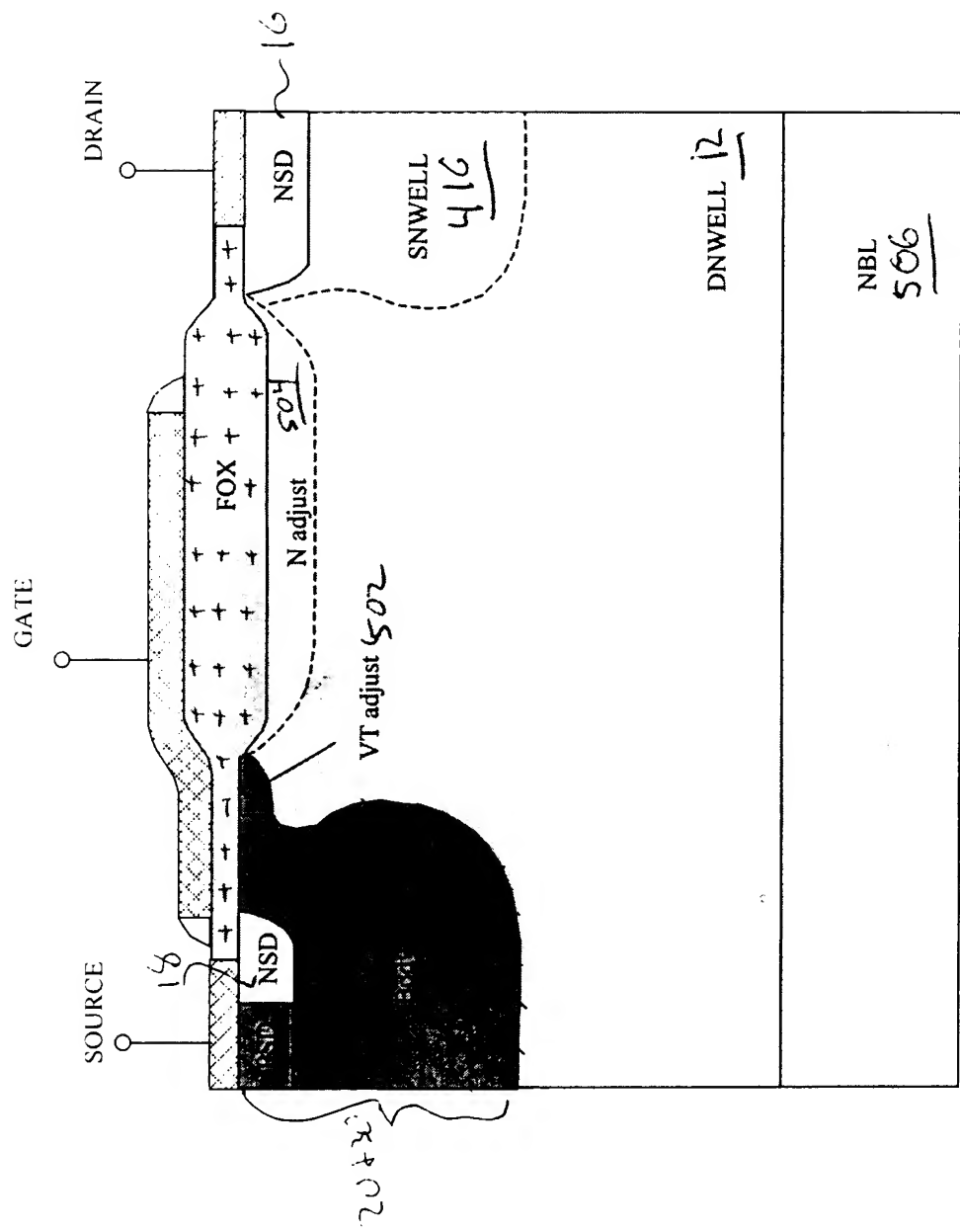


Fig. 5A

Lbc5 50V High-side Ldmos  
 nch\_ldmhs\_hv2



f's 50B

Lbc5 25V Low-side Ldmos  
 nch\_ldmls\_mv2

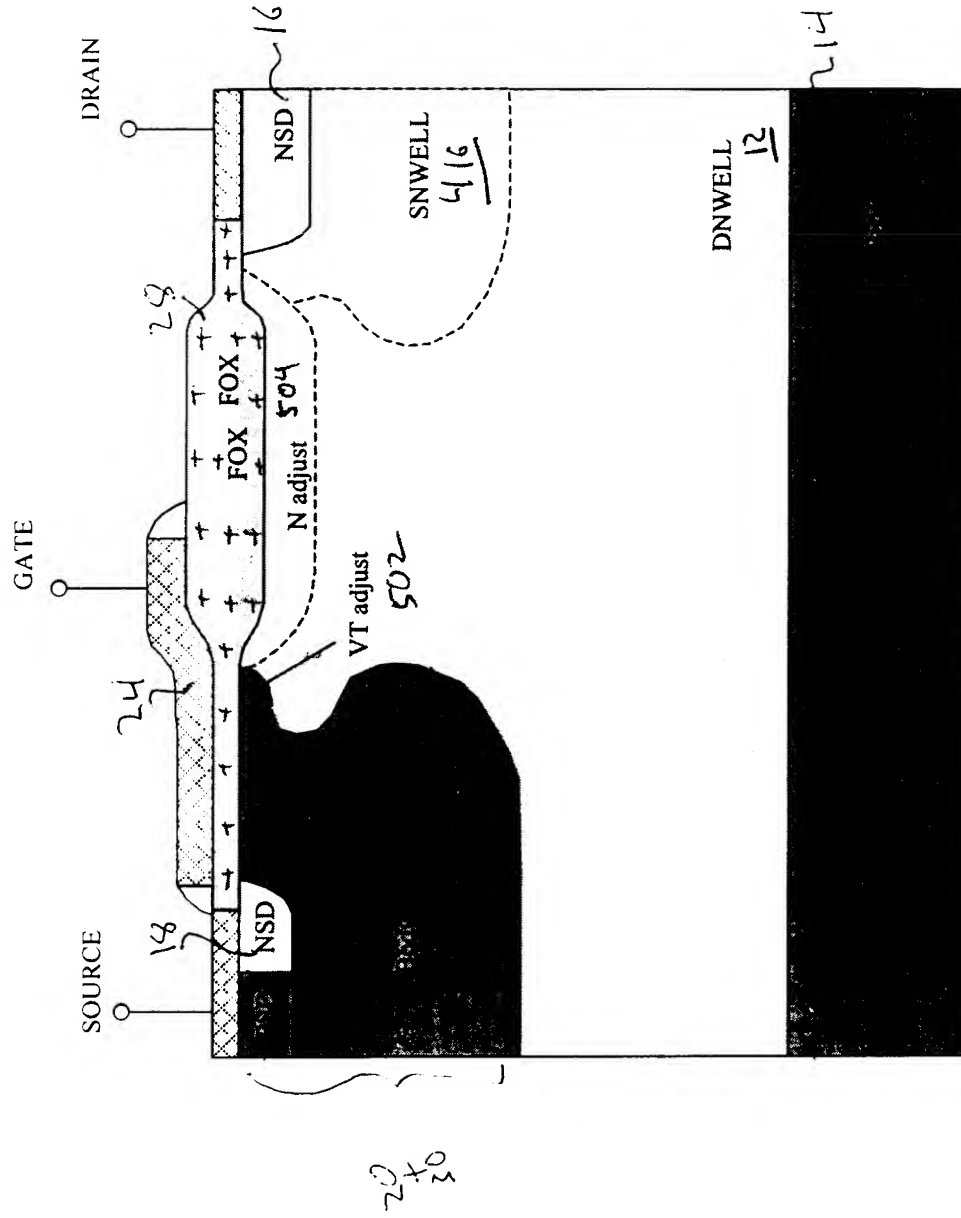


Fig. 5c